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## BIRD GENEALOGY.<sup>1</sup>

BY CHARLES W. TOWNSEND, M. D.

ARCHÆOPTERYX had teeth in its jaws, separate hip bones, bi-concave vertebræ, claws on its front limbs and a vertebrated tail, all marks of the reptile, in which group it might still be placed by some, were it not for the fact that the impression of the feathers has been preserved to us and stamps its essential bird nature. The links between birds and their reptilian predecessors are very perfect.

Now if birds are descended from reptiles, one may perhaps still find some traces of this lowly origin in the infantile period of bird life, just as there are various ear-marks of the savage of the jungle in the infancy of the most gilded city dweller, not to mention the transient and permanent reversions often found among adults of the race. Thus the Hoatzin of the Orinoco when young, has claws on the wings and scrambles about the branches in a truly reptilian style, a mode of progression that, according to Beebe, is still used by the adults.

One need not go so far as the Orinoco, however, to find evidences of the quadrupedal reptilian mode of progression in birds, as witness the actions of young Herons before they learn to fly, when with wings and legs they climb about their family tree almost as gracefully, I dare say, as did some of the ancient winged reptiles.

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<sup>1</sup> Read before the Nuttall Ornithological Club, March 4, 1912.

The extension of the so-called thumb or bastard wing in the Pigeon and other birds as they approach their perch may in the same way hark back to the time when the reptilian ancestor grasped with its fore feet its goal on the tree tops. Both young Green and Night Herons elevate the bastard wing at times as they climb about the trees, but I have never seen them attempt to use it for grasping.

Left with a couple of young English Sparrows on my hands owing to the destruction of their nest caused by the closing of a blind, I dropped them into a basin of tepid water, expecting the inert masses to sink or at least that their wabbly heads would fall below the surface. On the contrary they became endowed with life and vigor as if upon their native heath, and, with a combination of rapid wing strokes and leg action, and with necks outstretched they scudded across the surface of the miniature pond.

Blood will out, the reptilian ancestry was working! To make sure that this was not an accident I dropped a young Red-winged Blackbird into the pool below his nest. He too performed in exactly the same manner and safely reached some reeds up which he scrambled, and was there well taken care of by his excited parents. It is probable that many a passerine bird nesting over the water has been saved from destruction by this return to primitive methods.

Further experimentation with young Crows and Bronzed Grackles showed me that very young birds generally moved the wings alternately, while older ones always flapped both together as in flight. From this one would infer that the primitive reptilian scramble was naturally an alternate method while the simultaneous method was simply the more advanced style used in flight.

In the case of the Chimney Swift the method of flight has been thought to be an alternate flapping of the wings. Let anyone watch these curious birds as they dart with amazing speed through the air, and I am sure he will agree that the wings are used alternately with great rapidity. Steady flight by this method is, I believe, mechanically possible. One might argue therefore that the Swifts retain the more primitive or reptilian method of moving the front limbs and are therefore members of a very early branch on the avian tree, although it is possible that through extreme specialization they have returned to this form of flight.

If this prone method of propulsion on the water on all fours is a

primitive one, as indeed it must be, then birds that swim in an erect Duck-like manner must have advanced beyond this stage and become specialized. I have several times seen young Spotted Sandpipers that were unable to fly, swim with ease like little Ducks, although when very young and much frightened they return to the primitive reptilian scramble on all fours. All of the members of the Shore Bird family swim naturally if they find themselves in water beyond their depths. Phalaropes habitually disport themselves on the surface of the water as gracefully as miniature Swans. It would seem to be a natural inference, therefore, that the ancestors of Shore Birds were swimmers and that the art of swimming is inherited and not developed by this group, and that the Phalarope is a case of reversion. The awkward action of a young seal at its first bath is an example of a case where the art of swimming has been recently acquired by a group and where it is not one of long inheritance.

In the classification of birds proposed by Hans Gadow the order *Charadriiformes*, or Plover-like birds, includes the Shore Birds, Gulls, Auks and Pigeons. The Shore Birds, we have just seen, show evidence of a swimming ancestry, although, with the exception of the Phalaropes, they habitually prefer the shore under their feet, even if it is wet and partly covered with water, to the deep sea. The presence of partial webs, as in the Willet and in the Semipalmated Plover and Sandpiper, point to the former existence of the swimming habit, for these birds like other Shore Birds do not swim except when unexpectedly forced to it.

If the partial web in the foot of the adult Shore Bird showed the beginning of the swimming habit in birds of land ancestry we should find the young birds like young seals very inexpert in the water. As the reverse of this is the case our conclusion that these birds are of water ancestry must be correct.

Gulls and Terns have fully webbed feet but their habits at the present day hardly justify them in this possession. Webbed feet are of great advantage to the rapidly swimming bird and to the diving bird that depends on its feet. Now Terns rarely rest on the water or swim and Gulls do not often swim rapidly, in fact they rarely swim at all, but drift about, while if either bird descends below the surface, it is as a result of the velocity of its plunge from

the air, and its feet are probably not used. In fact the web, although useful, is largely wasted on these birds, and it is evident that it is ancient and points to a swimming ancestry. That this ancestry is less remote than in the Shore Birds is perhaps shown by the fact that a wing-tipped Gull, falling on the beach will take to the water, and swim vigorously out to sea, while a similarly crippled Shore Bird falling into the water will swim to the beach and endeavor to run inland to hide.

Before they are able to fly, young Skimmers are said to seek safety by running into the water, another evidence of their water ancestry. Chapman in his "Camps and Cruises of an Ornithologist," speaking of young Common Terns a few days old, says: "several were seen to enter an inflowing creek, drink repeatedly of the salt water and swim actively, in evident enjoyment of their natatorial powers, while the parents, who rarely alight on the water, watched them from the shore. Possibly here was an explanation of the value to Terns of webbed toes. Functionless in the adult they are of service to the young, before the power of flight is acquired." In this supposition he is probably right, although this service to the young is not the reason for the existence of the webs, but the observation points very clearly to the swimming ancestry of the birds. We could not have stronger proof of it.

That the Auks are out and out water birds there needs no defence, but one is at first sight puzzled by the presence of the Pigeons in this group. The older systematists placed the Pigeons with the Partridge and Domestic Fowl tribe, but Pigeons may be seen wading in puddles in a manner that would alarm the Barnyard Cock. I have been told by a Pigeon fancier that young Pigeons are much attracted by water, and fond of bathing therein, and that young birds are liable to drown themselves in tanks or troughs if these are accessible to Pigeon lofts. I recently placed a half-grown Domestic Pigeon in a wash-tub of tepid water. With head and neck erect, the bird swam rapidly with alternate strokes of the feet to the side of the tub. The wings were arched up and waved slightly,—not stretched out and flapped in the water as in the case of young Passerine birds. Its position was like that of a Duck but low in the water. Progress was much more rapid than on land where the bird stumbled awkwardly along. Indeed it had

never before left the nest. I repeated the experiment several times with the same result. A fact of considerable interest in this connection is that "A Pigeon with a perfectly webbed foot [was] evolved at Cambridge by only three years' selected crossings."<sup>1</sup> This may be looked upon as a case of reversion. The throwing of somersaults in the air similar to those of the Tumbler Pigeon has been reported in the case of the Black-bellied Plover.

The Sheathbill, *Chionis*, is so ancestral and generalized in its type that it suggests all the groups we have just been considering. Anatomically it is allied to the Oyster-catchers and the Gulls. It is often classed among the Plovers, but it is as marine in its haunts as are the Auks, and in flight it resembles the Gulls. Its appearance on land, gait and manner of courting are very much like those of a Pigeon, and it goes by the name of 'Kelp Pigeon.'

While young Terns take to the water, young Cormorants when pursued take to the shore. This would suggest a terrestrial ancestry of these birds, and according to Gadow, Cormorants strikingly resemble the New World Vultures, and the habit of both these birds of sitting with their wings spread is suggestive of kinship. The fact that Cormorants on rising into the air hop with the feet together, although their usual gait is a waddle, suggests a former arboreal life, and many Cormorants still nest in trees.

Tree dwellers naturally hop from branch to branch, and it is probable that the earliest birds were arboreal. When the tree-dwelling bird descends to the ground it naturally hops there also, but hopping is not a satisfactory method of progression for a ground-feeder,—it does not permit of cautious approach, and it is decidedly jarring. A walking gait, therefore, may be understood to indicate a long custom of feeding or dwelling on the ground. Although the Flicker is frequently seen on the ground, the ground habit is probably but recently acquired, for it has not learned to walk, while the Robin for example is able to run, and does so much more often than it hops. Young Robins show, however, their arboreal ancestry by hopping more than they run. Pipits, Horned Larks and Ipswich Sparrows have so completely departed from arboreal habits, that they run easily and walk with grace. Walking

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<sup>1</sup> T. Digby Pigott, "London Birds and other Sketches". London. 1902, p. 239.

appears to be acquired later than running. It is a very interesting fact that the Savannah Sparrow, frequenter of meadows and marshy pastures, generally hops even when on smooth ground, although it is also a good runner, while its near relation the Ipswich Sparrow, frequenter of sandy wastes, almost never hops and is a good walker.

Hérons as far as I know, although constantly in the water very rarely swim, but that they come of a swimming ancestry seems probable from the behavior of a young Green Heron not old enough to fly that I put in the water. It sat erect on the surface and swam off with a grace and ease that contrasted forcibly with its awkward movements on land. Not only was its poise graceful and Swan-like, but the speed with which it swam, the practiced manner in which it feathered its ungainly toes, the ease with which it threaded its way among the grass stalks, and dabbed every now and then at the water with its bill, all pointed to an inherited instinct, an instinct, however, that is largely if not entirely lost in adult life. This young Heron had never practiced the art of swimming before — it had probably never left the nesting tree, which was on a marsh island some distance from even the highest tides. Adult Herons like some Shore Birds show their swimming ancestry by a distinct web between the middle and outer toes.

The use of the wings under water in some diving birds and the significance of this fact I have already discussed in another place.<sup>1</sup>

One is apt to think of evolution as a thing of the past, an accomplished fact, and to forget that at the present period of time this great law is still as existent as it has been since the world began. With change in environment, there comes through natural selection acting on slight variations and occasional mutations a change in the structure to fit the new environment, and in time a new species is developed. As new species arose in the past, so they must be in various stages of formation at the present time. The great group of American Warblers are for the most part slender-billed, insect-eating birds, that go south with the approach of cold weather. One of them, however, is enabled to spend the winter on the bleak New England coast by a change from an insectiv-

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<sup>1</sup> Auk, XXVI, 1909, pp. 234 to 248.

orous to a seed-eating habit. The Myrtle Warbler thrives through the cold winters chiefly on a diet of bayberries, while all the other members of this family seek more genial climes, where they may continue to live on insects. Not only this, but a large number of its own species go south, and winter in the Greater Antilles, Mexico and Panama, where insect food is of course abundant. The New England birds eat not only bayberries, but also the seeds of grass and weeds that extend above the snow, and they glean the bark of trees like Titmice.

Now birds like men are clannish; in fact there is a remarkable similarity between animal and human nature,—which is not so surprising when one considers our origin and relationships. Among savages slight differences due to different environment, set apart one group or race from another. Each race considers itself *the* people, and despises, fights and refuses to mix with the other. The Eskimo and the Indian, although both manifestly of Eastern origin, so dislike each other that intermarriage, except under the influence of civilization, is rare. This tendency makes of course for differentiation; without this tendency the constant mixture of races would make the production of new species more difficult. While this clannishness is most marked among savages, it is also so pronounced in civilized races that each nation classes all foreigners, especially those that speak a different tongue, as their inferiors with whom intermarriage is not to be thought of. The more ignorant the individuals, that is to say the more primitive or animal-like, the more intense is this clannishness, and, its boundaries may be limited, not by the nation or state, but even by the village in which the individuals live. Mr. Punch's collier who proposed 'leaving 'alf a brick' at the stranger in town is an instance in point.

The element of home also enters into this exclusiveness which favors the formation of races, and hence of new species. This factor is strongly shown in the human species unless the individual has become cosmopolitan by travel and education; and the inhabitants of what appears to an outsider to be a most desolate region regard their home as superior to any other country on the globe, and pine if taken away from it.

Now the seed-eating Myrtle Warbler that spends its winters in the cold and stormy north is undoubtedly as clannish as the



Eskimo, and considers itself superior to the south-seeking Myrtle Warbler, and it would probably pine for its northern home if transplanted by force with the rest of the species to tropical regions. In addition, its clannishness probably impels it to chose a summer home apart from its southern relations.

At present man cannot distinguish the northern from the southern Myrtle Warbler, just as in the remote past, it is probable that the Eskimo could not be distinguished from the Indian. In time, however, aided by this inherent clannishness and love of home, one might predict that a larger race of northern Myrtle Warblers would be formed with thicker, stronger bills and more muscular gizzards. Indeed I have endeavored to investigate these three points in order to discover whether a beginning had been made in the evolution of this new species, but I have not as yet examined enough material to throw any light on the subject.

One can easily see how important the element of clannishness is, for without it interbreeding might for a long time, if not indefinitely delay the birth of a new species. The importance of clannishness in the evolution of races and species, has I believe never been given due weight.

As among men so among birds there are striking differences in ambition and ability to succeed. Some men, some families, some nations are progressive,—they are always reaching out for new opportunities and taking advantage of them. Others are retiring, unambitious and contented to remain where they are. One of the most remarkably progressive birds is the Horned Lark which has spread to nearly every part of the continent, and has made each part so much its home that it has adapted itself to the environment to the extent of changing its own form and plumage. There are now recognized fourteen different North American races or subspecies of the Horned Lark. The pushing character of the bird is shown in the recent extension of the breeding range of the Prairie Horned Lark from the central part of the continent to New England. In 1889 it was first recorded as breeding in Vermont, and the same year in central Massachusetts. In 1903 it reached the sea and bred at Ipswich and has come there to raise its young ever since, meanwhile increasing in numbers throughout the New England states.<sup>1</sup>

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<sup>1</sup> Auk, XXI, 1904, p. 81.

The Song Sparrow has adapted itself in twenty different forms to all parts of the continent, and is abundant almost everywhere. Incidentally it is interesting to compare a map of North America showing the various lingual races of Indians with one showing the various races of Song Sparrows. Both maps show an extensive race in the more uniform east — the Algonquin Indians, and the *melodia* sparrow,— while both show in the diversified surface of the extreme West numerous races of both man and bird.

What a contrast is the enterprise shown by the Song Sparrow to the lack of enterprise in the case of such a bird as the Swamp Sparrow, for instance. Although first cousin to the Song Sparrow and although it is spread over a large territory, the Swamp Sparrow limits itself to the almost uniform environment of swamps, and has therefore never developed any races.

Another bird which is showing great developmental or evolutionary possibilities is the Grackle both Purple and Bronzed. This bird instead of shunning man has been bright enough to appreciate the fact that it is safest from persecution when in most intimate relations with him. It has come into his towns and cities, and it does not hesitate to build its nests on his houses. In Boston, although there had been a few previous records, it was not until 1900 that the Bronzed Grackle began to breed regularly in the Public Garden, and the numbers increased so that thirty-two nests were counted there by Mr. H. W. Wright in 1906. In 1907 they first began to build nests in the vines on my Ipswich house, and two pair have nested there every summer since, when I permitted. In the matter of food they are not particular, or rather their appetite is a catholic one, and they can adapt themselves to circumstances. They are able to pick eggs out of a Robin's nest and peas from pods in the garden, and they undoubtedly serve a useful purpose in towns and cities by diminishing the English Sparrow nuisance. I have seen one hold down a struggling English Sparrow with its foot while it deliberately pecked out its brains. While the English Sparrows follow Robins hunting worms on the lawn, and saucily snatch the worm away from their very mouths, they keep at a safe distance from the Grackle, and if he so much as stops to look at them, they fly off in terror. In fact Grackles put to flight the innocent Robins. I have seen a Grackle partly run

and partly hop with wings extended toward a Robin that was digging worms near by, making the Robin desert the spot on which the Grackle then dug.

But the most interesting development of the Grackle, one that shows its great adaptability and intelligence, is a habit it has of picking up food from the water, after the manner of the Herring Gull. A Grackle will hover close to the water its head to the wind, and then suddenly drop, and with its bill pick up from the surface some morsel as gracefully as a Gull. This they do at times without wetting their plumage; at other times the bill, feet and tail are immersed, while I once saw a Grackle splash his whole body into the water and entirely immerse his head, to emerge without difficulty, carrying in his bill what appeared to be a small silvery fish. I have seen them after sailing and hovering over the water in a high wind with the spray dashing about them, skilfully pick up food from the tops of the waves.

It is easy to picture an island community of Grackles becoming more and more addicted to a maritime life, owing perhaps to the shrinking of their terrestrial food supply due to a change of climate or to land subsidence. Would not these habits become in time as much inherited as are similar habits in the Gulls? Or, to put the question in another way, were not the inherited traits of the Gulls originally acquired?

The Ipswich Sparrow is the only strictly dune dweller among the birds. Its summer home is on Sable Island, an island of sand dunes off Nova Scotia, and it spends its winters along the sandy portions of the Atlantic coast. It is evidently a near relation of the Savannah Sparrow, which is somewhat smaller and darker, and lives chiefly in marshes and open fields from Labrador to New Jersey. As the glaciers receded we can picture the gradual pushing north of the Savannah Sparrows, and their extension to the great sandy wastes that fringed the coast for miles. As the land sank and the waters rose restricting these regions of sand, the struggle for life among the clan that preferred the sand dunes must have been an intense one, and it is probable that the larger and stronger birds, as well as those that more nearly matched in color their surroundings were the more likely to survive. Isolation from the main land finally aided in the work, and at last a distinctly new species

was evolved, a bird larger than the Savannah Sparrow of the main land, and of a gray or sandy, rather than a black and brown color, so that when it squatted in terror on the sand the sailing Hawk was more apt to pass it by.

It seems to me, therefore, that the evolution of the Ipswich Sparrow is comparatively recent, and that the age of this species may be counted by the paltry fifty thousand years or so that have elapsed since the last glacial period.

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## A RECONSIDERATION OF THE AMERICAN BLACK DUCKS WITH SPECIAL REFERENCE TO CERTAIN VARIATIONS.

BY JOHN C. PHILLIPS.

THERE are several species of primitive ducks which for many reasons are of peculiar interest, on account of their remarkable geographical distribution and mutual interrelationship. This group of species is composed of *Anas fulvigula*, *Anas tristis*, *Anas diazi*, *Anas wyvilliana* and *Anas laysanensis*. Most of these are poorly represented in collections and this fact has led to certain misconceptions. It is the purpose of the following notes to point out some of these mistakes, and to say a few words about individual and sexual variation.

To begin with I wish to call attention to the principal difficulty in the proper understanding of these local races; this is the presence of a sexual difference in plumage, increasing probably with age, and comparable, with that of the Hawaiian duck (*Anas wyvilliana*). In this way all these related species can be separated from *A. tristis* in which the sexes are similar. At first I thought that this sex difference was confined to *A. diazi* and I started to limit these notes to the latter species, but as more specimens turned up I thought it better to consider all the American Black Ducks.